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**REMARKS**

**Pending Claims**

Claim 19 has been amended to more clearly describe Applicant's invention. In particular, this claim has been amended to recite the method by which the lyogel is prepared. Support for this amendment can be found throughout the present specification and claims as originally filed, including, for example, page 13 and original claim 4. Also, claims 18 and 21 have been amended to correct typographical errors. No new matter has been added. Thus, claims 6-24 are pending.

**Claim Objection**

In paragraph 2 of the Office Action, the Examiner has objected to claim 21, indicating that the word "ins" in line 2 should be "in". Applicant has corrected this typographical error.

**Rejection of Claims under 35 U.S.C. § 112, second paragraph**

The Examiner has rejected the claims 20 and 23 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In paragraph 4 of the Office Action, the Examiner states that there is insufficient antecedent basis for the feature "the aqueous water glass solution" recited in line 2 of claim 20 and for the feature "the orthosilicate" recited in line 1 of claim 23.

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Applicant respectfully disagree. Regarding claim 20, this claim directly depends from 19, and step a) of claim 19, as herein amended, recites "wherein the lyogel is a silicate-type hydrogel prepared by bringing an aqueous water glass solution to a pH value  $\leq 3$ ". Thus, Applicant believes there is sufficient antecedent basis for the phrase "the aqueous water glass solution" recited in claim 20.

Regarding claim 23, this claim depends directly from claim 19, and step c) of claim 19 recites "the lyogel is washed with a solution of an orthosilicate". Thus, Applicant believes there is sufficient antecedent basis for the phrase "the orthosilicate" recited in claim 23.

Applicant therefore believes claims 20 and 23 are not indefinite and respectfully requests that this rejection be withdrawn.

#### **Rejection of Claims under 35 U.S.C. § 103(a)**

##### **Claims 6 and 8-24**

The Examiner has rejected the above-identified claims as being unpatentable over WO 96/22942 (of which Schwertfeger et al., U.S. Patent No. 5,888,425 is used as a working English translation) in view of Lentz (U.S. Patent No. 3,122,520).

In paragraph 6 of the Office Action, the Examiner states that WO 96/22942 discloses a process for the preparation of organically modified aerogels comprising the steps of claim 1, including the step of washing the lyogel with a solution of an orthosilicate capable of bringing about condensation as claimed in claim 19. The Examiner notes that, while WO 96/22942 teaches that a surface-silylating substance of formula I is used, the reference lacks the teaching of using a disiloxane of the claimed formula.

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For this reason, the Examiner relies on Lentz, which the Examiner states is cited for its teaching of organosilicon compounds that may be used as surface-silylating/modifying substances for a hydrogel compound that is subsequently washed free of water and dried. The Examiner concludes that it would have been obvious to one having ordinary skill in the art, seeing WO 96/22942 and Lentz in combination, to have substituted any of the surface silylating substances of Lentz, including hexaethyldisiloxane or hexamethyldisiloxane, which meet the claimed formula, as the surface-silylating substance in the invention of WO 96/22942 with the expectation of successful results since WO 96/22942 and Lentz teach their organosilicon compounds are for the same purpose and are similarly for use in forming aerogels and the compounds react according to the same reaction.

Applicant respectfully disagrees. Claim 19 recites a process for the preparation of organically modified aerogels with permanently hydrophobic surface groups comprising steps a-e. As amended herein, step a) of this process involves the introduction of a lyogel into a reactor, wherein the lyogel is a silicate-type hydrogel prepared by bringing an aqueous water glass solution to a pH value  $\leq 3$  with the aid of an acidic ion-exchanged resin or an inorganic acid to produce silicic acid and, via the addition of a base, polycondensing the silicic acid to give a  $\text{SiO}_2$  gel.

While WO 96/22942 describes a process having some of the steps of claim 19, this reference lacks a teaching of the use of a disiloxane of the claimed formula, as noted by the Examiner. To cure this deficiency the Examiner relies on Lentz, stating that one skilled in the art, seeing these references in combination, would be able to substitute the surface-silylating substances of Lentz and, in particular, specific disiloxanes, for the surface-silylating substances in WO 96/22942, with the expectation of successful results.

However, Applicant believes there would be no such motivation and to do so would go against the teaching of Lentz. Lentz describes a two step method, "the first of which involves heating a silica sol under strong acid conditions" to form a hydrogel, and the "second step involves mixing this hydrogel with the defined organosilicon compound" (see column 2, lines 5-11). As stated in Lentz, the essence of the invention "resides in the discovery that better reinforcing fillers are obtained when a silica hydrosol is heated under strong acid conditions (hereinafter called 'the

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acid heating step'), prior to reacting the gel with the organosilicon compound (hereinafter called 'the hydrophobing step' or 'hydrophobing')" (see column 2, lines 15-21). Lentz further states that it is "essential" that the sol be heated with sufficient strong mineral acid so that the pH of the sol during heating is one or less (see column 2, lines 35-40) and demonstrates the criticality of using this step prior to the hydrophobing step in the Examples (see Example 2). Finally, Lentz states that the "novelty of the process of this invention resides in the combination of the first step with the second step to produce improved fillers" (see column 2, lines 11-14).

Thus, the invention of Lentz is the combination of an essential acid-heating step and a hydrophobing step. Applicant therefore believes that Lentz cannot be cited for its teaching of specific organosilicon compounds alone, as stated by the Examiner. One skilled in the art, based on the teaching of Lentz, would only use the specified surface-silylating substances for the hydrophobing step in combination with the acid-heating step. To do otherwise would go against the expressed teaching of this reference.

WO 96/22942 does not teach the acid-heating step described in Lentz. Thus, this reference clearly lacks the essential element of Lentz et al. For this reason, one skilled in the art would simply not be motivated to combine these references and would therefore not be motivated to replace any of the surface-silylating substances of WO 96/22942 with those of Lentz. The hydrophobing substances in Lentz are specifically taught in combination with an acid-heating step, which is not disclosed in WO 96/22942.

Furthermore, even if these references were combined, which Applicant does not believe can be done, the resulting combination would not be the method of the present claims. In particular, since the acid-heating step is clearly described as essential to the invention of Lentz, Applicant believes one skilled in the art may be motivated to apply this gel forming step in the method of WO 96/22942. However, this is not the method recited in claim 19.

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Therefore, Applicant believes that claim 19 is patentable over WO 96/22942 in view of Lentz. Furthermore, claims 6, 8-18, and 20-24, which depend directly or indirectly from claim 19, recite further embodiments of the present invention and, for at least the reasons discussed above, are also patentable over these references.

Applicant therefore believes that claims 6 and 8-24 are patentable over WO 96/22942 in view of Lentz and respectfully requests that this rejection be withdrawn.

#### Claim 7

The Examiner has rejected the above-identified claim as being unpatentable over WO 96/22942 in view of Lentz (U.S. Patent No. 3,122,520), as applied to claims 6 and 8-24 above, and further in view of WO 96/06809 (of which Frank et al., U.S. Patent No. 5,866,027 is used as a working English translation).

In paragraph 7 of the Office Action, the Examiner states that WO 96/22942 lacks a teaching of adding fibers to the lyogel. The Examiner therefore relies on WO 96/06809, which the Examiner states is relied on for its teaching of adding fibers to the gel during formation in order to produce mechanically stable xerogels. The Examiner concludes that it would have been obvious to one having ordinary skill in the art to have added fibers to the sol in the process of WO 96/22942 in order to increase the mechanical stability of the produced xerogel.

Applicant respectfully disagrees. As discussed in more detail above, since the hydrophobing substances in Lentz are specifically taught in combination with an acid-heating step, which is not disclosed in WO 96/22942, one skilled in the art would not be motivated to combine these references and would therefore not be motivated to replace any of the surface-silylating substances of WO 96/22942 with those of Lentz. The hydrophobing substances in Lentz are specifically taught in combination with an acid-heating step, which is not disclosed in WO 96/22942. Furthermore, even if these references were combined, which Applicant does not believe can be done, one skilled in the art may be motivated to apply this gel forming step in the method of WO 96/22942.

However, this is not the method recited in claim 7.

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WO 96/06809 does not cure the deficiencies of WO 96/22942 in view of Lentz. While this reference describes the use of fibers added to form mechanically stable xerogels, there is no disclosure teaching or suggestion of the use of the disiloxanes of formula I as the surface-silylating agent. This has been acknowledged by the Examiner in paragraph 8 of the Office Action.

Applicant therefore believes that claim 7 is patentable over WO 96/22942 in view of Lentz and further in view of WO 96/06809 and respectfully requests that this rejection be withdrawn.

#### Claims 6-24

The Examiner has rejected the above-identified claims as being unpatentable over WO 96/06809 (of which Frank et al., U.S. Patent No. 5,866,027 is used as a working English translation) in view of Lentz (U.S. Patent No. 3,122,520) and WO 96/22942 (of which Schwertfeger et al., U.S. Patent No. 5,888,425 is used as a working English translation).

In paragraph 8 of the Office Action, the Examiner states that WO 96/06809 discloses a process for the preparation of organically modified aerogels comprising the steps of claim 1. The Examiner further states that this reference teaches that a surface-silylating substance having the formula  $R'_nMX_m$  are used to replace original surface groups with inert groups of the type  $MR'_n$ . While the Examiner notes that, when X is a radical  $-OR''$ , the surface-modifying substance is a siloxane, the Examiner states that WO 96/06809 lacks the teaching of using a disiloxane of the claimed formula.

However, the Examiner also states that, since the list of surface-modifying substances of WO 96/06809 is exemplary, one skilled in the art would have been motivated to look to the prior art for other surface-modifying substances that may be used in its invention. For this reason, the Examiner relies on Lentz, stating that this reference is cited for its teaching of organosilicon compounds that may be used as surface-silylating substances for a hydrogel compound that is subsequently washed free of water and dried. The Examiner states that Lentz teaches that the organosilicon compounds react with the original surface group of a hydrogel according to the same reaction as in WO

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96/06809 and overlap those of this reference, including the use of trimethylchlorosilane. Since Lentz teaches the use of disiloxanes of the claimed formula, including hexaethyldisiloxane and hexamethyldisiloxane, the Examiner concludes that it would have been obvious to one having ordinary skill in the art, see the references WO 96/06809 and Lentz in combination, to have substituted any of the surface-silylating substances of Lentz, including hexaethyldisiloxane and hexamethyldisiloxane, as the surface-silylating substance in the invention of WO 96/06809 with the expectation of successful results since WO 96/06809 and Lentz teach the organosilicon compounds are for the same purpose and are similarly for use in forming aerogels and the compounds react according to the same reaction.

The Examiner also states that WO96/06809 is also silent as to a teaching that prior to step c), the lyogel is washed with a solution of an orthosilicate capable of bringing about condensation of the claimed formula. For this reason, the Examiner relies on WO 96/22942, which the Examiner states is cited for its teaching of a process of preparing organically modified aerogels similar to those of WO 96/06809. The Examiner also states that WO 96/22942 teaches an optional step of being subjected to structure reinforcement before the silylation by reacting the gel with a solution of an orthosilicate according to the claimed formula. The Examiner therefore concludes that it would have been obvious to one having ordinary skill in the art to have performed the orthosilicate reaction step of WO 96/22942 in the process of WO96/06809 in order to achieve structure reinforcement of WO96/06809 gels with the expectation of similar and successful results since WO 96/06809 and WO 96/22942 are similarly directed to preparing hydrophobic aerogels by similar processes.

Applicant respectfully disagrees. Claim 19 recites a process for the preparation of organically modified aerogels with permanently hydrophobic surface groups comprising steps a-e. As amended herein, step a) of this process involves the introduction of a lyogel into a reactor, wherein the lyogel is a silicate-type hydrogel prepared by bringing an aqueous water glass solution to a pH value  $\leq 3$  with the aid of an acidic ion-exchanged resin or an inorganic acid to produce silicic acid and, via the addition of a base, polycondensing the silicic acid to give a  $\text{SiO}_2$  gel.

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While WO 96/06809 describes a process having some of the steps of claim 19, this reference lacks a teaching of the both use of a disiloxane of the claimed formula as the surface-silylating agent as well as to the use of a solution of an orthosilicate capable of bringing about condensation, which has been noted by the Examiner. To cure these deficiencies, the Examiner relies on Lentz and WO 96/22942.

Regarding Lentz, the Examiner states that one skilled in the art, seeing these references in combination, would be able to substitute the surface-silylating substances of Lentz and, in particular, specific disiloxanes, for the surface-silylating substances in WO 96/06809, with the expectation of successful results. However, Applicant believes there would be no such motivation and to do so would go against the expressed teaching of Lentz.

Lentz describes a two step method, "the first of which involves heating a silica sol under strong acid conditions" to form a hydrogel, and the "second step involves mixing this hydrogel with the defined organosilicon compound" (see column 2, lines 5-11). As stated in Lentz, the essence of the invention "resides in the discovery that better reinforcing fillers are obtained when a silica hydrosol is heated under strong acid conditions (hereinafter called 'the acid heating step'), prior to reacting the gel with the organosilicon compound (hereinafter called 'the hydrophobing step' or 'hydrophobing')" (see column 2, lines 15-21). Lentz further states that it is "essential" that the sol be heated with sufficient strong mineral acid so that the pH of the sol during heating is one or less (see column 2, lines 35-40) and demonstrates the criticality of using this step prior to the hydrophobing step in the Examples (see Example 2). Finally, Lentz states that the "novelty of the process of this invention resides in the combination of the first step with the second step to produce improved fillers" (see column 2, lines 11-14).

Thus, the invention of Lentz is the combination of an essential acid-heating step and a hydrophobing step. Applicant therefore believes that Lentz cannot be cited for its teaching of specific organosilicon compounds alone, as stated by the Examiner. One skilled in the art, based on the teaching of Lentz, would only use the specified surface-silylating substances for the



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hydrophobing step in combination with the acid-heating step. To do otherwise would go against the expressed teaching of this reference.

WO 96/06809 does not teach the acid-heating step described in Lentz. Thus, this reference clearly lacks the essential element of Lentz et al. For this reason, one skilled in the art would simply not be motivated to combine these references and would therefore not be motivated to replace any of the surface-silylating substances of WO 96/06809 with those of Lentz. The hydrophobing substances in Lentz are specifically taught in combination with an acid-heating step, which is not disclosed in WO 96/06809.

Furthermore, even if these references were combined, which Applicant does not believe can be done, the resulting combination would not be the method of the present claims. In particular, since the acid-heating step is clearly described as essential to the invention of Lentz, Applicant believes one skilled in the art may be motivated to apply this gel forming step in the method of WO 96/06809. However, this is not the method recited in claim 19 and for this reason is therefore patentable over WO 96/06809 in view of Lentz.

Regarding WO 96/22942, while this reference teaches an optional step of being subjected to structure reinforcement using an orthosilicate solution, this reference does not disclose the use of a disiloxane of the formula recited in claim 19. This was acknowledged by the Examiner in paragraph 6 of the Office Action. Thus WO 96/22942 does not cure the deficiency of WO 96/06809 in view of Lentz. Furthermore, as discussed in more detail above, WO 96/22942 cannot be combined with Lentz since WO 96/22942, like WO96/06809, also lacks the essential acid-heating step of Lentz.

Therefore, Applicant believes that claim 19 is patentable over WO 96/06809 in view of Lentz and WO 96/22942. Furthermore, claims 6-18 and 20-24, which depend directly or indirectly from claim 19, recite further embodiments of the present invention and, for at least the reasons discussed above, are also patentable over these references.

Applicant therefore believes that claims 6-24 are patentable over WO 96/06809 in view of Lentz and WO 96/22942 and respectfully requests that this rejection be withdrawn.

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Conclusion

In view of the foregoing remarks, Applicant believes that this application is in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would further expedite the prosecution of the subject application, the Examiner is invited to call the undersigned.

Respectfully submitted,



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Robert M. Amici  
Reg. No. 52,554  
CABOT CORPORATION  
Law Department  
157 Concord Road  
Billerica, MA 01821  
(978) 670-6191

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